

PROCEEDINGS
OF THE
ROYAL SOCIETY OF LONDON

SERIES A

CONTAINING PAPERS OF A MATHEMATICAL AND
PHYSICAL CHARACTER.

VOL. LXXXIII.

L O N D O N :

PRINTED FOR THE ROYAL SOCIETY AND SOLD BY
HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS LATE MAJESTY.

MAY, 1910.

LONDON :
HARRISON AND SONS, PRINTERS IN ORDINARY TO HIS LATE MAJESTY,
ST. MARTIN'S LANE.

CONTENTS.



SERIES A. VOL. LXXXIII.

No. A 559.—November 3, 1909.

	PAGE
On the Effect of Previous Magnetic History on Magnetisation. By Prof. Ernest Wilson, G. F. O'Dell, and H. W. K. Jennings. Communicated by Sir William H. Preece, K.C.B., F.R.S.	1
On the Resolving Power of Photographic Plates. By C. E. Kenneth Mees, D.Sc. Communicated by Sir William Ramsay, K.C.B., F.R.S.	10
Thermal Conductivity of Air and other Gases. By George W. Todd, M.Sc., Research Scholar of the University of Birmingham. Communicated by Prof. J. H. Poynting, F.R.S.	19
Experiments to test whether the Secondary γ -Rays are polarised. By R. D. Kleeman, D.Sc., B.A., Research Student of Emmanuel College, Cambridge. Communicated by Prof. E. Rutherford, F.R.S.	40
The Spectrum of Radium Emanation. By Herbert Edmeston Watson, B.Sc., 1851 Exhibition Scholar, University College, London. Communicated by Sir William Ramsay, K.C.B., F.R.S.	50
On the Perception of the Direction of Sound. By Lord Rayleigh, O.M., F.R.S. ...	61
On the Physical Properties of Gold Leaf at High Temperatures. By J. C. Chapman and H. L. Porter, Wheatstone Laboratory, King's College, London. Communicated by Prof. H. A. Wilson, F.R.S.	65
Functions of Positive and Negative Type, and their Connection with the Theory of Integral Equations. By J. Mercer, B.A., Trinity College, Cambridge. Communicated by Prof. A. R. Forsyth, Sc.D., LL.D., F.R.S. (Abstract)	69
Note on the Spontaneous Luminosity of a Uranium Mineral. By the Hon. R. J. Strutt, M.A., F.R.S., Professor of Physics, Imperial College of Science, South Kensington	70
On Flapping Flight. By Maurice F. FitzGerald, B.A., Professor of Engineering in Queen's College, Belfast. Communicated by Lord Rayleigh, O.M., F.R.S.	72
A Wave-length Comparator for Standards of Length. By Dr. A. E. H. Tutton, F.R.S. (Abstract)	79
The Use of Wave-length Rulings as Defining Lines on Standards of Length. By Dr. A. E. H. Tutton, F.R.S. (Abstract)	81

No. A 560.—December 10, 1909.

The Use of Wave-length Rulings as Defining Lines on Standards of Length. By Dr. A. E. H. Tutton, F.R.S. (Abstract)	81
BAKERIAN LECTURE.—On the Statistical and Thermodynamical Relations of Radiant Energy. By Prof. Sir J. Larmor, Sec. R.S.....	82
The Accumulation of Helium in Geological Time.—II. By the Hon. R. J. Strutt, F.R.S., Professor of Physics, Imperial College of Science, South Kensington ...	96
The Aberrations of a Symmetrical Optical Instrument. By H. C. Pocklington, M.A., D.Sc., F.R.S.	99
The Boiling Point of Sulphur corrected by Reference to New Observations on the Absolute Expansion of Mercury. By H. L. Callendar, M.A., LL.D., F.R.S., Professor of Physics, and H. Moss, B.Sc., A.R.C.S., Demonstrator in Physics at the Royal College of Science, S.W.....	106
The Motional Effects of the Maxwell Æther-stress. By E. Cunningham, M.A., Fellow of St. John's College, Cambridge, Assistant Professor of Applied Mathematics in University College, University of London. Communicated by Prof. Sir J. Larmor, Sec. R.S.	109
On the Change in Hue of Spectrum Colours by Dilution with White Light. By Sir W. de W. Abney, K.C.B., D.Sc., D.C.L., F.R.S.	120
Harmonic Tidal Constants for certain Chinese and New Zealand Ports. By Thomas Wright, formerly of the Nautical Almanac Office. Communicated by Sir George H. Darwin, K.C.B., F.R.S.	127
The Electric Conductivity and Density of Solutions of Hydrogen Fluoride. By Prof. E. G. Hill, D.Sc., Muir College, Allahabad, and Dr. A. P. Sirkar, Muir College, Allahabad. Communicated by Prof. H. A. Miers, F.R.S.	130
Obituary Notices of Fellows deceased :—	
Eleuthère Élie Nicolas Mascart ; William Edward Wilson ; Francis Elgar ; Georg von Neumayer ; Lord Rosse ; Antoine Henri Becquerel.	

(At end of volume.)

No. A 561.—January 7, 1910.

On the Refraction and Dispersion of Neon. By Clive Cuthbertson, Fellow of University College, London, and Maude Cuthbertson. Communicated by Prof. F. T. Trouton, F.R.S.	149
On the Refraction and Dispersion of Air, Oxygen, Nitrogen, and Hydrogen, and their Relations. By Clive Cuthbertson, Fellow of University College, London, and Maude Cuthbertson. Communicated by Prof. F. T. Trouton, F.R.S.....	151
On the Refraction and Dispersion of Sulphur Dioxide and Hydrogen Sulphide, and their Relation to those of their Constituents. By Clive Cuthbertson, Fellow of University College, London, and Maude Cuthbertson. Communicated by Prof. F. T. Trouton, F.R.S.	171

	PAGE
On the Nature of the Hydrogen Flocculi and their Structure at Different Levels in the Solar Atmosphere. By George E. Hale, For. Mem. R.S., and Ferdinand Ellerman. (Plate 1)	177
On the Distribution of the Röntgen Rays from a Focus Bulb. By G. W. C. Kaye, B.A. (Cantab.), D.Sc. (Lond.), A.R.C.Sc., Trinity College, Cambridge. Communicated by Prof. Sir J. J. Thomson, F.R.S.....	189
On the Nature of the Ionisation of a Molecule by an α -Particle. By R. D. Kleeman, D.Sc., B.A., formerly Research Student of Emmanuel College, Cambridge, Mackinnon Student of the Royal Society. Communicated by Prof. Sir J. J. Thomson, F.R.S.	195
The Crystalline Structure of Iron at High Temperatures. By Walter Rosenhain, B.A., D.Sc., and J. C. W. Humfrey, B.A., M.Sc., of the National Physical Laboratory. Communicated by R. T. Glazebrook, F.R.S. (Plate 2).....	200
The Spectrum of Magnesium Hydride. By Prof. A. Fowler, A.R.C.S., F.R.A.S. Communicated by Prof. H. L. Callendar, F.R.S. (Abstract)	210
The Relation of Thallium to the Alkali Metals : a Study of Thallium-Zinc Sulphate and Selenate. By A. E. H. Tutton, M.A., D.Sc., F.R.S.	211
A Critical Study of Spectral Series. Part I.—The Alkalies, H and He. By W. M. Hicks, F.R.S. (Abstract)	226

No. A 562.—February 10, 1910.

Address of the President, Sir Archibald Geikie, K.C.B., at the Anniversary Meeting on November 30, 1909	229
Recombination of Ions at Different Temperatures. By P. Phillips, D.Sc., B.A., Royal Veterinary College, Camden Town. Communicated by Prof. F. T. Trouton, F.R.S.	246
Conduction of Heat through Rarefied Gases. By Frederick Soddy, M.A., and Arthur John Berry, B.A., Physical Chemistry Laboratory, University of Glasgow. Communicated by Prof. Sir J. Larmor, Sec. R.S.	254
On a Method of Determining the Viscosity of Gases, especially those Available only in Small Quantities. By A. O. Rankine, B.Sc., Assistant in the Department of Physics, University College, London. Communicated by Prof. F. T. Trouton, F.R.S.	265
On the Atomic Weight of Strontium. By Sir Edward Thorpe, C.B., LL.D., F.R.S., and Arthur Gordon Francis, B.Sc., F.I.C.....	277
On the Extinction of Colour by Reduction of Luminosity. By Sir W. de W. Abney, K.C.B., D.Sc., D.C.L., F.R.S.	290
The Accumulation of Helium in Geological Time.—III. By the Hon. R. J. Strutt, F.R.S., Professor of Physics, Imperial College of Science, South Kensington ...	298

No. A 563.—March 2, 1910.

	PAGE
On the Nature of the Diffraction Figures due to the Heliummeter. By Philip Francis Everitt, University College, London. Communicated by Prof. Karl Pearson, F.R.S. (Plate 3)	302
On the Nature of Magneto-cathodic Rays. By H. Thirkill, B.A. (Cantab.), B.Sc. (Lond.), Research Scholar, Clare College, Cambridge. Communicated by Prof. Sir J. J. Thomson, F.R.S.	324
On the Approximate Arithmetical Solution by Finite Differences of Physical Problems involving Differential Equations, with an Application to the Stresses in a Masonry Dam. By L. F. Richardson. Communicated by Dr. R. T. Glazebrook, F.R.S. (Abstract)	335
The Initial Accelerated Motion of Electrified Systems of Finite Extent, and the Reaction produced by the Resulting Radiation. By George W. Walker, A.R.C.Sc., M.A. Communicated by Prof. Sir J. Larmor, Sec. R.S. (Abstract)	336
On the Shapes of the Isotherms under Mountain Ranges in Radio-active Districts. By Charles H. Lees, D.Sc., F.R.S., Professor of Physics in the East London College, University of London	339
On the Propagation of a Disturbance in a Fluid under Gravity. By F. B. Pidduck, B.A., Fellow of Queen's College, Oxford. Communicated by Prof. A. E. H. Love, F.R.S.	347
On the Velocity of Steady Fall of Spherical Particles through Fluid Medium. By E. Cunningham, M.A., Fellow of St. John's College, Cambridge, Assistant Professor of Applied Mathematics, University College, London. Communicated by Sir Joseph Larmor, Sec. R.S.	357
On the Flow of Water through Pipes and Passages having Converging or Diverging Boundaries. By Prof. A. H. Gibson, D.Sc., University College, Dundee. Communicated by Prof. J. E. Petavel, F.R.S.	366

No. A 564.—March 22, 1910.

On the Polarisation of X-Rays compared with their Power of exciting High Velocity Cathode Rays. By L. Vegard, "Universitets-stipendiat" of Christiania University. Communicated by Prof. W. H. Bragg, F.R.S.	379
On the Electricity of Rain and Snow. By George C. Simpson, D.Sc. Communicated by Dr. Gilbert T. Walker, F.R.S.	394
Long-Period Determination of the Rate of Production of Helium from Radium. By Sir James Dewar, M.A., Sc.D., LL.D., F.R.S.	404
Note on Carbon Monosulphide. By Sir James Dewar, M.A., LL.D., Sc.D., F.R.S., Jacksonian Professor in the University of Cambridge, and Humphrey Owen Jones, M.A., D.Sc., Jacksonian Demonstrator in the University of Cambridge .	408
The Effect of Pressure upon Arc Spectra.—Titanium. By R. Rossi, M.Sc. Communicated by Arthur Schuster, F.R.S.	414

	PAGE
The Absorption Spectra of Vapours of the Alkali Metals. By P. V. Bevan, M.A. Communicated by Prof. Sir J. J. Thomson, F.R.S. (Plate 4)	421
On a Novel Phenomenon in the Diurnal Inequality of Terrestrial Magnetism at certain Stations. By Robert B. Sangster. Communicated by Dr. C. Chree, F.R.S.	428
The Photographic Action of the α -Particles emitted from Radio-active Substances. By S. Kinoshita. Communicated by Prof. E. Rutherford, F.R.S.	432

No. A 565.—April 14, 1910.

The Depression of Freezing Point in very Dilute Aqueous Solutions. By T. G. Bedford, M.A., Sidney Sussex College, Cambridge. Communicated by Prof. E. H. Griffiths, F.R.S. (Abstract)	454
Colour Blindness and the Trichromatic Theory of Colour-vision. By Sir William de W. Abney, K.C.B., D.Sc., D.C.L., F.R.S.	462
The Solubility of Xenon, Krypton, Argon, Neon, and Helium in Water. By A. von Antropoff, University College, London, 1908 ; Polytechnikum, Riga, 1909. Communicated by Sir William Ramsay, K.C.B., F.R.S.	474
The Influence of Pressure on the Boiling Points of Metals. By H. C. Greenwood, M.Sc., Beyer Fellow of the University of Manchester. Communicated by Prof. E. Rutherford, F.R.S.	483
The Scattering of the α -Particles by Matter. By H. Geiger, Ph.D. Communicated by Prof. E. Rutherford, F.R.S.	492
The Ionisation produced by an α -Particle. Part II.—Connection between Ionisation and Absorption. By H. Geiger, Ph.D. Communicated by Prof. E. Rutherford, F.R.S.	505
On the Viscosities of the Gases of the Argon Group. By A. O. Rankine, B.Sc., Assistant in the Department of Physics, University College, London. Commu- nicated by Prof. F. T. Trouton, F.R.S.	516
The Change of Carbon Disulphide into a Gaseous Product Condensable and Explosive near the Temperature of Liquid Air. By Sir James Dewar, M.A., Sc.D., LL.D., F.R.S., Jacksonian Professor in the University of Cambridge ; and Humphrey Owen Jones, M.A., D.Sc., Jacksonian Demonstrator in the University of Cambridge	526
The Ionisation of Various Gases by the β -Rays of Actinium. By R. D. Kleeman, D.Sc., B.A., Mackinnon Student of the Royal Society. Communicated by Prof. W. H. Bragg, F.R.S.	530

No. A 566.—May 11, 1910.

BAKERIAN LECTURE.—The Pressure of Light against the Source : the Recoil from Light. By J. H. Poynting, Sc.D., F.R.S., and Guy Barlow, D.Sc.	534
The Extinction of Sound in a Viscous Atmosphere by Small Obstacles of Cylindrical and Spherical Form. By C. J. T. Sewell, B.A., Trinity College, Cambridge. Communicated by Prof. H. Lamb, F.R.S. (Abstract)	547

	PAGE
The Phosphorescence produced by the α - and β -Rays. By E. Marsden, B.Sc., Assistant Lecturer and Demonstrator in Physics at the East London College, University of London. Communicated by Prof. E. Rutherford, F.R.S.	548
Theory of the Luminosity produced in certain Substances by α -Rays. By E. Rutherford, F.R.S., Professor of Physics, University of Manchester.....	561
Measurements of the Absolute Indices of Refraction in Strained Glass. By L. N. G. Filon, M.A., D.Sc., Fellow and Lecturer of University College, London. Com- municated by Prof. F. T. Trouton, F.R.S.	572
Some Phenomena of Magnetic Disturbances at Kew. By Charles Chree, Sc.D., LL.D., F.R.S., Superintendent of the Observatory Department of the National Physical Laboratory. (Abstract)	579

OBITUARY NOTICES OF FELLOWS DECEASED.

Index	xxv
-------------	-----
